REMARKS

Applicants have carefully reviewed the Office Action mailed February 26, 2007. Claims 1, 7, 16-21, 25-27, and 30 are amended, and claims 2 and 3 are cancelled. With the amendments, claims 1 and 4-31 are pending. Reconsideration is respectfully requested in view of the foregoing amendments and the comments set forth below.

35 U.S.C. § 101 Rejection

1. In the Office Action on pages 2-3 in section 4, claims 16, 17, 25, and 26 are rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter due to the recitation of "computer readable medium." Although Applicant respectfully disagrees, Applicant thanks the Examiner for the suggested claim language. Claims 16, 17, 25, and 26 are amended accordingly.

35 U.S.C. § 103 Rejection Based on Das in view of Yang

2. In the Office Action on pages 3-8 in section 6, claims 1-11, 16-21, 25-27, and 30-31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,896,176 to Das et al. (hereinafter Das) in view of U.S. Patent No. 6,490,319 to Yang (hereinafter Yang). Initially, it is noted that claims 2 and 3 are cancelled. The Applicant respectfully traverses the rejection of the remaining claims.

Claim 1 has been amended to more clearly recite the invention. Claim 1 has been amended by incorporating the subject matter of cancelled claims 2 and 3. Additional support for the amendments to claim 1 may be found at, for example, specification, page 8, lines 11-21, and page 28, line 20, to page 29, line 2. As amended, claim 1 recites a "method for encoding a video sequence with a non-static viewpoint, said video sequence having a plurality of frames and

comprising a background composite constructed from the plurality of frames and foreground regions for individual frames of the plurality of frames, comprising the step of: encoding said video sequence based on balancing bits per pixel for said background composite with bits per pixel for said foreground regions to achieve similar quality between the background composite and the foreground regions in a reconstructed video sequence, wherein said bits per pixel for said background composite are based on a number of bits for texture encoding of said background composite and a number of bits for warp points of said background composite, and said bits per pixel for said foreground regions are based on a number of bits for texture encoding of said foreground regions and a number of bits for shape encoding for said foreground regions."

In rejecting claim 1, the Office Action aligns Das with the recited "method for encoding a video sequence having a plurality of frames, said video sequence comprising a background composite and foreground regions, comprising the step of: encoding said video sequence." As recognized by the Office, Das fails to teach "encoding said video sequence based on balancing bits per pixel for said background composite once per video sequence with bits per pixel for said foreground regions on a per frame basis to achieve similar quality between the background composite and the foreground regions in a reconstructed video sequence." To overcome the deficiencies of Das, the Office Action relies on Yang. The combination proposed by the Office Action fails to set forth a prima facie case of obviousness for at least the following four reasons.

First, Das fails to teach "a video sequence with a **non-static viewpoint**, said video sequence having a plurality of frames and comprising a background composite constructed from the plurality of frames and foreground regions for individual frames of the plurality of frames." In contrast, Das teaches encoding video with a **static** viewpoint, which is a much simpler problem to solve than encoding a video sequence with a **non-static** viewpoint. Specifically, Das

requires that the view of the video camera is **fixed** and that the background is **stationary**, which results in a static viewpoint and a single background image. Das, column 4, lines 53-57. Yang fails to overcome the failings of Das. In fact, the encoding of Yang is most beneficial where the background is of little interest and the foreground, such as the face of a person, is of more interest (i.e., a **static** viewpoint). Yang, column 1, lines 17-23. Thus, Das in view of Yang fails to teach "a video sequence with a **non-static viewpoint**, said video sequence having a plurality of frames and comprising a background composite constructed from the plurality of frames and foreground regions for individual frames of the plurality of frames."

Second, Yang fails to teach balancing bits per pixel for the background composite with bits per pixel for the foreground regions, where "said bits per pixel for said background composite are based on a number of bits for texture encoding of said background composite and a number of bits for **warp points** of said background composite." Yang teaches balancing bits between the background and the foreground on a per frame basis using a **single parameter**, λ, to control the **contrast** between the background and foreground. Yang, column 2, lines 38-39; column 3, lines 33-42 and 55-67; column 4, lines 44-53; column 5, lines 8-15. Yang fails to teach using anything like a number of bits for **warp points** of the background composite to balance bits. In fact, Yang would not even need to use warp points when encoding the background because the background and foreground are encoded together on a per frame basis, and warp points are not needed when encoding the background and foreground in this manner. See Yang, column 2, lines 38-39; column 3, lines 33-42; column 5, lines 23-26. Das fails to overcome the deficiencies of Yang. As discussed above, Das requires a **stationary** background, which results in a single background image. Das, column 4, lines 53-57. As such, Das does not need to use warp points when encoding the background and the foreground because the

background is stationary. Hence, Das in view of Yang fails to teach balancing bits per pixel for the background composite with bits per pixel for the foreground regions, where "said bits per pixel for said background composite are based on a number of bits for texture encoding of said background composite and a number of bits for **warp points** of said background composite."

Third, Yang fails to teach balancing bits per pixel for the background composite with bits per pixel for the foreground regions, where "said bits per pixel for said foreground regions are based on a number of bits for texture encoding of said foreground regions and a number of bits for **shape encoding** for said foreground regions." As discussed above, Yang teaches balancing bits between the background and the foreground on a per frame basis using a **single parameter**, λ, to control the **contrast** between the background and foreground. Yang, column 2, lines 38-39; column 3, lines 33-42 and 55-67; column 4, lines 44-53; column 5, lines 8-15. Yang fails to teach using anything like a number of bits for **shape encoding** of the foreground regions to balance bits. In fact, Yang would not even need to use shape encoding of the foreground because the background and the foreground are encoded together on a per frame basis, and shape encoding is not needed when encoding the background and the foreground in this manner. See Yang, column 2, lines 38-39; column 3, lines 33-42; column 5, lines 23-26. Das fails to overcome the deficiencies of Yang. Hence, Das in view of Yang fails to teach balancing bits per pixel for the background composite with bits per pixel for the foreground regions, where "said bits per pixel for said foreground regions are based on a number of bits for texture encoding of said foreground regions and a number of bits for **shape encoding** for said foreground regions."

Fourth, Yang teaches away from the combination proposed by the Office Action. To achieve similar quality contrast between the background and the foreground, Yang teaches using the same quantization level Q_{max} for both the background and the foreground. Yang, column 3,

lines 33-42. However, if the same quantization level is used in the system of Das, the background and foreground may have **different** qualities, not the **same** quality. For example, if the quantization level 4 (between fine and coarse) is used for both I-frame encoding and P-frame encoding in Das, a quality difference would be apparent between the background and foreground. This quality difference occurs because, in Yang's case, both the background and foreground are encoded using the same method, either I-frame encoding or P-frame encoding, while in Das's case, the background is I-frame encoding only, but the foreground regions may be mainly P-frame encoding. This quality difference between I-frame and P-frame encoding becomes more apparent when the quantization step increases. Hence, in order to achieve similar quality between the background and the foreground, one of ordinary skill in the art would **not** look to modify the teachings of Das with those of Yang. Thus, Yang teaches away from the combination proposed by the Office Action.

Therefore, for at least the above four reasons, claim 1 is allowable over the combination of Das and Yang.

Claims 4-11, 16, and 17 are dependent from claim 1 and are allowable as being dependent from an allowable claim.

Claim 18 recites similar subject matter to that recited in claim 1 and is, thus, allowable for similar reasons.

Claim 19 has been amended to more clearly recite the invention. Claim 19 has been amended by incorporating the subject matter of amended claim 21. Additional support for the amendments to claim 1 may be found at, for example, specification, page 13, line 15, to page 15, line 15. As amended, claim 1 recites a "method for encoding a video sequence with a non-static viewpoint, said video sequence having a plurality of frames and comprising a background

composite constructed from the plurality of frames and foreground regions for individual frames of the plurality of frames, comprising the steps of: determining a background quantization step for said background composite based on an estimated number of bits for a compressed background composite, a number of bits for the compressed background composite, and an estimated background quantization step, wherein the estimated background quantization step is based on the estimated number of bits for the compressed background composite and the number of bits for the compressed background composite; encoding said background composite once per said video sequence based on said background quantization step; determining a starting foreground quantization step for said foreground regions based on said background quantization step and a desired bit rate; and encoding said foreground regions on a per frame basis based on said starting foreground quantization step to achieve similar quality between the background composite and the foreground regions in a reconstructed video sequence."

In rejecting claim 19, the Office Action relies on the reasoning used to reject claims 1, 8, and 11. The combination proposed by the Office Action fails to set forth a prima facie case of obviousness for at least the following five reasons.

First, for the same reasons discussed above for claim 1, Das and Yang fail to teach "a video sequence with a **non-static viewpoint**, said video sequence having a plurality of frames and comprising a background composite constructed from the plurality of frames and foreground regions for individual frames of the plurality of frames."

Second, Yang fails to teach "determining a background quantization step for said background composite based on an estimated number of bits for a compressed background composite, a number of bits for the compressed background composite, and an **estimated background quantization step**." In rejecting claim 10, which recites features similar to those

recited in claim 19, the Office Action aligns the recited estimated background quantization step with the maximum quantization level Q_{max} of Yang. Yang, column 3, line 33-42. The maximum quantization level Q_{max} of Yang, however, is not an estimated background quantization step. Instead, the maximum quantization level Q_{max} of Yang is an **end point** for values that the background quantization level Q_{back} may take. In particular, the background quantization level Q_{back} may be a value in the range from Q_{max} to M. Yang, column 3, lines 27-31; Figure 1B. The value for the background quantization level Q_{back} in the range from Q_{max} to M is determined by a user-controlled parameter value λ. Yang, column 3, lines 55-67. Hence, the maximum quantization level Q_{max} of Yang is not an **estimated background quantization step**. Das fails to overcome the failings of Yang. Thus, Yang fails to teach "determining a background quantization step for said background composite based on an estimated number of bits for a compressed background composite, a number of bits for the compressed background composite, and an estimated background quantization step."

Third, Yang fails to teach "wherein the estimated background quantization step is **based on the estimated number of bits for the compressed background composite and the number of bits for the compressed background composite**." In rejecting claim 10, which recites features similar to those recited in claim 19, the Office Action aligns the recited estimated background quantization step with the maximum quantization level Q_{max} of Yang, the recited estimated number of bits for the compressed background composite with the target bit rate R of Yang, and the recited number of bits for the compressed background composite with the actual bit rate of Yang. Yang, column 3, line 33-42. The alignment by the Office Action, however, is incorrect. Yang does **not** teach that the maximum quantization level Q_{max} is based on the target bit rate R and the actual bit rate. Instead, Yang teaches that the actual bit rate is **based on** the

maximum quantization level Q_{max}, and **not** that the maximum quantization level Q_{max} is based on the actual bit rate. Further, Yang teaches that the actual bit rate is **compared to** the target bit rate R, and **not** that the maximum quantization level Q_{max} is based on the target bit rate R. Yang, column 3, lines 36-38 ("The maximum quantization level for both the foreground and background provides an actual bit rate for the video frame which is close to the target bit rate, R."). The maximum quantization level Q_{max} of Yang is **not** determined from **an estimated number of bits for an compressed background composite** and **a number of bits for a compressed background composite**. Das fails to overcome the failings of Yang. Hence, Das in view of Yang fails to teach "wherein the estimated background quantization step is based on the estimated number of bits for the compressed background composite and the number of bits for the compressed background composite."

Fourth, Yang fails to teach "determining a **starting foreground quantization step** for said foreground regions based on **said background quantization step** and a desired bit rate." In rejecting claim 11, the Office Action aligns a similar recitation with a discussion in Yang regarding maximum quantization level Q_{max} and the target bit rate R. Yang, column 3, lines 33-42. Yang, however, teaches, **first**, determining the quantization level for the foreground Q_{fore} in step 406 of Figure 4 and then, **second**, determining the quantization level for the background Q_{back} in step 408 of Figure 4 based on the quantization level for the foreground Q_{fore} and the target bit rate R. Yang, column 5, lines 11-23. Yang does **not** teach, **first**, determining the quantization level for the background Q_{back} and then, **second**, determining the quantization level for the foreground Q_{fore} based on the background Q_{back} and the target bit rate R. Das fails to overcome the failings of Yang. Hence, Yang fails to teach "determining a starting foreground

quantization step for said foreground regions based on said background quantization step and a desired bit rate."

Fifth, for the same reasons discussed above for claim 1, Yang teaches away from the combination of Das and Yang proposed by the Office Action.

Therefore, for at least the above five reasons, claim 19 is allowable over the combination of Das and Yang.

Claims 20, 21, 25, and 26 are dependent from claim 19 and are allowable as being dependent from an allowable claim.

Claim 27 recites similar subject matter to that recited in claim 19 and is, thus, allowable for similar reasons.

Claim 30 recites similar subject matter to that recited in claim 1 and is, thus, allowable for similar reasons.

Claim 31 is dependent from claim 30 and is allowable as being dependent from an allowable claim.

35 U.S.C. § 103 Rejection Based on Das in view of Yang and Ryoo

3. In the Office Action on pages 8-9 in section 7, claims 12-15, 22-24, 28 and 29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Das in view of Yang, and further in view of U.S. Patent No. 5,990,957 to Ryoo (hereinafter Ryoo). The Applicant respectfully traverses the rejection.

Claims 12-15 are dependent from claim 1 and are allowable as being dependent from an allowable claim.

Claims 22-24 are dependent from claim 19 and are allowable as being dependent from an allowable claim.

Claims 28 and 29 are dependent from claim 27 and are allowable as being dependent from an allowable claim.

THEREFORE, because all rejections have been overcome, it is submitted that claims 1 and 4-31 are allowable, and such allowance is requested.

Respectfully submitted,

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